Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

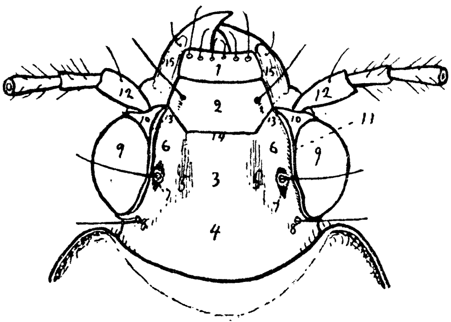
JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE FRONS IN BEMBIDIUM, WITH DESCRIPTIONS OF NEW SPECIES.

BY F. E. BLAISDELL, M.D.

There is often connected with the recognition and placing of species in the systematic scheme difficulties which become perplexing and annoying, not so much from the nature of the characters as from the instability or tendency to variation in such characters among species naturally closely allied.

I was forcibly impressed by these facts while working over the species of *Bembidium* contained in the collections of Mr. Charles Fuchs, Dr. E. C. Van Dyke, and my own. It is the perplexities that arose while dealing with the frontal characters that have brought about this attempt at their elucidation. I wish to express my thanks to the above-mentioned gentlemen for the use of material and also for many suggestions.



Head of *Bembidium suspectum.*—1. Labrum; 2. Epistoma; 3. Frons; 4. Vertex; 5. Frontal sulcus (internal of Hayward); 6. Frontal costa or ridge; 7. Anterior supraorbital setigerous puncture within fovea; 8. Posterior supraorbital setigerous puncture, fovea not developed; 9. Eye; 10. Plate in front of eye; 11. Ocular bead, ocular sulcus just within; 12. Basal joint of antenna; 13. Anterior lateral process of frons; 14. Frontal suture; 15. Mandibular scrobe, bearing a seta arising from a puncture. (Magnified 28.5 diameters.)

That part of the cephalic exoskeleton constituting the interocular region is called the *frons*. It is bounded above by the vertex, from which it is separated by an imaginary line; below by the epistoma, with which it is connate, the line of union being marked by the frontal suture; laterally by the eyes, in front of which is a strong chitinized plate supporting the antennæ. The union of this plate with the side of the frons in front of the eye forms the frontal ridge.

In form the frons is subquadrate, with its anterior lateral angles produced and embracing the obliquely truncated basal angles of the epistoma.

Laterally, where the frons meets the eye, the margin becomes raised into a fine convex ridge or ocular bead, which is continuous anteriorly with the frontal ridge, posteriorly it winds around the eye to become evanescent.

Immediately within this bead is a fine sulcus or stria parallel to it, usually well marked and varying in the degree of its width and depth, and conveniently termed the ocular stria. The ocular beads and striæ are common to all Bembidia.

In all species of *Bembidium* there are developed other frontal ridges and sulci; these reach their minimum of development in some species of the *variegatum* group, where the ocular striæ are bounded internally by rather broad convex longitudinal ridges, which in turn are limited internally by broad shallow grooves—the internal sulci of Hayward—which pass more or less gradually into the plane or convex central area of the frons.

This condition is defined by Mr. Hayward in his paper treating of the species of *Bembidium*, Group XII (*variegatum*), as "Frontal grooves single, parallel or rarely very feebly convergent." In some individuals these grooves and ridges are quite obsolete.

In the different groups of species these grooves and ridges may be parallel to or converge toward the median line.

Generally the supraorbital setigerous punctures are placed in small pit-like depressions or foveæ upon the convexity of the ridges. In some groups it is by the extension and coalescence in a longitudinal direction of the foveæ bearing the punctures that this single broad, convex ridge becomes divided into two lateral moieties, forming as a result two ridges separated by a sulcus—the *external sulcus* of Hayward—the setigerous punctures now being found in the bottom of this groove.

This condition reaches its maximum development in *B. sulcatum*.

As long as the ridges and grooves are parallel to the median line of the insect, they *do not* extend on to the epistoma (Pl. III, figs. 2, 5 and 8, representative of Groups I to XIII, XV and XVIII to XXI of Mr. Hayward's paper); with convergency the extension on to the epistoma does take place (figs. 1, 3, 4, 6, 7 and 9, representative of Groups XIV, XVI and XVII of the above-mentioned paper). Observe that this only occurs in those species with double frontal grooves.

The following is an explanation of the figures given in the plate, which are camera lucida tracings, the details being filled in as accurately as possible. I believe them to be true representations of the specimens from which they were made, the accuracy centering upon the ridges and grooves, and are representative of Mr. Hayward's groups, as follows:

Figure 8, Group XII, *B. vile,* drawn from a specimen collected at San Diego, Cal. From its general facies it is usually placed in collections with individuals of Groups XIV or XVII. An examination of the frons and other group characters will readily distinguish it.

"*Frontal grooves single, parallel.*" The single ridge of either side terminating anteriorly at apex of the frontal process of the corresponding side, not passing on to the epistoma, posteriorly becoming attenuated and disappearing near the posterior border of the eye and bearing upon its convexity the supraorbital setigerous punctures; ocular bead well developed; ocular sulcus narrow and normal; internal grooves normal.

Fig. 2, Group XIII, *B. bifasciatum,* drawn from a large specimen collected at Poway, San Diego county, Cal.

"*Frontal grooves single, parallel.*" Frons broad, feebly convex, disposition of grooves and ridges as in Group XII. Anterior supraorbital punctures in large shallow foveæ. Ocular bead and sulcus well developed and normal.

Fig. 5, Group XV, *B. affine,* drawn from a specimen collected in Virginia.

"*Frontal grooves slightly oblique, the outer interrupted.*" The obliquity being so slight and the ridges not extending on to the epistoma, I believe it to be next in the evolutionary series.

The anterior foveæ have extended backward and forward, separating the two lateral moieties of the single ridges, forming the first rudiments of the interrupted external groove of Hayward. The disposition of the sculpturing is nearly as in Group XII—*i. e., no extension on to the epistoma;* ocular bead and sulcus fine but otherwise normal.

Figs. 3 and 6, Group XIV, *B. 4-maculatum* and *B. dubitans.* The former drawn from a specimen collected in Massachusetts; the latter from a specimen collected near Portland, Ore.

"*Frontal grooves double, oblique, the outer interrupted.*" With the obliquity an extension has taken place on to the epistoma. The external groove is really not developed, on account of the non-extension of the foveæ. The setigerous punctures of the epistoma are within .the anterior extremities of the developing external grooves, while the other punctures are within foveæ, as in figs. 2 and 8, the extension of the foveæ being not developed. Ocular bead and sulcus normal.

Figs. 4 and 9, Group XVII, *B. anguliferum* and *B. assimile.* The former drawn from a specimen in the Van Dyke collection, and collected in Lake county, Cal.; the latter species from a specimen taken in Ohio.

"*Frontal grooves very deep, strongly convergent, double, the inner groove long, the outer shorter and often feebly marked.*" Ridges strongly developed and very convex. Here is a stronger tendency for the foveæ to coalesce; it can be seen that the foveæ on epistoma are elongate, the splitting of the ridges being more evident. The internal groove is strongly developed and entire; ocular beads not developed at margins of the eyes, but present on outer borders of frontal processes; ocular sulcus feeble but normal.

Figs. 7 and 1, Group XVI, *B. concinnum* n. sp. and *B. sulcatum.* The former collected by Dr. Van Dyke in Eldorado county, Cal.; the latter species was taken in the Caraboo District, B. C., and is in the Fuchs collection.

"*Frontal grooves double, scarcely* (*to moderately*) *converging, the outer entire*" (or nearly so).

I have placed *concinnum* in the present group on account of the frontal grooves moderately converging, and also from the greater tendency toward the development of the external groove, by the appearance of intermediate foveæ between those of the punctures of the epistoma and those of the anterior supraorbital punctures. The internal groove is well developed; ocular bead and sulcus normal.

In *sulcatum* the full development is reached—the internal and external grooves are entire; the internal ridges are entire, the external being bifurcate to receive the posterior supraorbital punctures. Ocular bead entire; the ocular sulcus broad and normal in extent.

Bembidium obscuripenne n sp.

Elongate, very moderately convex; color black and shining, with an obscure brownish humeral spot extending backward to near middle third; a similar spot at junction of middle and posterior thirds.

Head slightly wider than thorax at apex; eyes large; antennæ about one-half as long as body.

Prothorax about one-third wider than long, slightly wider at base than at apex; the latter slightly emarginate in circular arc; median line entire, moderately fine; transverse impressions distinct, the posterior deeper; basal impressions rugulose, broad, deep and bistriate; sides arcuate in anterior three-fourths, feebly sinuate in posterior one-fourth, with margins narrowly reflexed, marginal sulcus moderately broad; basal angles rectangular, carinate, carinæ nearly parallel to median line.

Elytra oblong-ovate, about one-half wider than thorax, one-half longer than wide, striate, striæ moderately impressed, entire or feebly impressed at apex, strongly punctate to one-fourth distance from apex; third stria with first dorsal puncture a slight distance posterior to basal one-fourth, second a slight distance anterior to basal fourth, intervals flat. Legs and abdomen dark piceous to black. Length 5–5.5 mm.

Tarsi.—First two joints of anterior tarsi of male dilated; first subquadrate with inner anterior angle prolonged as usual, second moderately dilated.

Diagnostic characters.—Closely related to *longulum.* Basal angles of thorax rectangular, striæ subentire, more convex form and presence of brownish elytral spots, with many other characters if Mr. Hayward's measurements of *longulum* are correct.

Two specimens collected in Oregon. Fuchs' collection.

Bembidium humboldtensis n. sp.

Form elongate, somewhat robust, convex; color coal black; surface very smooth and shining.

Head as wide as thorax at apex; antennæ less than one-half the length of the body.

Prothorax convex, about one-fourth wider than long, length equal to base, as wide or slightly wider at base than apex, surface smooth; apex truncate; base evenly and feebly arcuate; median line distinct, slightly abbreviated before and behind; transverse impressions feeble; basal impressions moderately deep and rather sharply defined, unistriate; sides narrowly reflexed, arcuate in front, oblique and straight behind; hind angles obtuse, not rounded, and without trace of carina; smooth and convex between basal impressions and margins.

Elytra oblong-oval, one-half wider than thorax, slightly more than one-half longer than wide, striate; striæ abbreviated, except the first and sometimes the second, seventh represented at tip by a short groove, strongly and rather coarsely punctate to posterior third, then impunctate; third striæ with first dorsal puncture one-third from base, the second about one-third from apex; intervals nearly flat. Beneath and femora black, tibiæ and tarsi slightly piceous. Length 4 mm.

Diagnostic characters.—Resembles *recticolle* in general form and should follow it in our lists.

Readily recognized by the form of the basal impressions, absence of carinæ, shorter antennæ, and the elytral striæ being obsolete and impunctate in basal third.

Described from a series of twelve specimens collected in Humboldt county, Cal., by Dr. Van Dyke.

Bembidium vandykei n. sp.

Form rather broad, elongate, scarcely depressed; color nigro-piceous, more or less tinged with bluish, especially the head and pronotum; surface smooth and shining.

Head slightly wider than thorax at apex; antennæ reaching to first dorsal punctures of elytra.

Prothorax about one-third wider than long, length equal to width of base, base equal to apex; base very feebly arcuate; apex slightly emarginate; median line impressed, abbreviated in front, extending nearly to base; transverse impressions distinct, anterior angulate and feeble; basal impressions moderately broad, deep and bistriate; sides arcuate in anterior three-fourths, sinuate behind, nearly parallel for a short distance in front of hind angles, which are rectangular and feebly carinate.

Elytra about one-half wider than thorax and about one-half longer than wide, oblong-ovate, finely striate; striæ entire, impunctate, fifth strongly grooved at tip; third stria with first dorsal puncture one-eighth of the length of elytra in front of middle, the second one-fourth from apex; intervals flat.

First two joints of anterior tarsi dilated; the first oblong with inner angle feebly produced, the second feebly dilated with inner angle large and produced. Legs piceous. Length 5–6.3 mm.

Diagnostic characters.—Its resemblance to *planatum;* prothorax wider in comparison to its length; impunctate striæ; smaller size; more slender form and slightly more convex elytra. Should follow *planatum* in the list. Named from a series of specimens collected in Mendocino county, Cal., by Dr. Edwin C. Van Dyke.

Bembidium falsum n. sp.

Form oblong-ovate, elongate, depressed; color nigro-piceous, faintly tinged with bluish; surface smooth and more or less extremely finely reticulate.

Head about as wide as thorax at middle; antennæ reaching to anterior dorsal punctures.

Prothorax one-fifth to one-fourth of its width wider than long; slightly narrower at base than apex; base about equal to the length, and very feebly arcuate; apex slightly emarginate; median line impressed at middle and subentire; transverse impressions distinct, the anterior feeble; basal impressions moderately broad, deep, bistriate; sides arcuate in anterior three-fourths, sinuate behind, parallel for a short distance in front of basal angles, which are recangular and feebly carinate.

Elytra about one-half wider than thorax, and about two-thirds longer than wide, oblong, sides nearly parallel; strongly striate; striæ entire, impunctate, fifth strongly grooved at tip; third stria with first dorsal puncture just slightly in front of the middle, the second one-fourth from apex; intervals convex. Legs piceous; anterior tarsi with first two joints dilated; the first oblong with inner angle produced, the second transverse, feebly dilated with inner angle large and produced. Length 5.5–6 mm.

Diagnostic characters.—Resembles *planiusculum,* from which it may be recognized by its larger head, elongate and parallel form, and deeper elytral striæ. It can precede the latter species in our lists.

Described from a series of specimens taken in Mendocino county, Cal., by Dr. Van Dyke.

Bembidium suspectum n. sp.

Form moderately broad, rather convex; color nigro-æneous; elytra piceo-æneous with paler spots arranged as follows: a small basal spot occupying intervals four and five, a small oval spot in third interval just in advance of first dorsal puncture, similar spots in intervals four, five and six, increasing in length from within outward, another large spot extending from sixth stria to margin, occupying about the second one-fourth. A large spot commencing at fourth stria opposite posterior dorsal puncture and extending to the margin, and an apical pale spot; these pale areas may vary as to size and degree of coalescence.

Head and thorax alutaceous; elytra sculptured with exceedingly minute transverse rugulæ.

Head very slightly wider than thorax at apex; antennæ one-half as long as body.

Prothorax subquadrate, one-half wider than long; base slightly wider than apex and feebly arcuate at middle; apex slightly emarginate; median line distinct, abbreviated in front, obsoletely so behind; transverse impressions well marked; basal impressions broad and deep, bistriate; sides evenly arcuate in anterior three-fourths, subsinuate in basal fourth; hind angles rectangular, strongly carinate with carinæ parallel to the median line.

Elytra oblong-oval, one-half wider than thorax, and scarcely one-third longer than wide; deeply striate; striæ entire, distinctly punctate to posterior dorsal puncture, then more feebly, becoming impunctate near apex, seventh slightly grooved at tip; intervals flat, the third with first dorsal puncture one-third from base, the second one-fourth from apex. Beneath tinged with greenish, shining; legs nigro-piceous, tinged with green. Length 6.2 mm.

Diagnostic characters.—Near *approximatum;* recognized by its larger size and broader form; elytra oblong-oval; basal angles of thorax rectangular. Should precede the above species in our lists.

Type collected at Oregon City, Ore., on the shore of the Willamette river. Several specimens.

Bembidium fuchsii n. sp.

Form elongate, moderately convex. Color black. Antennæ, tibiæ and tarsi piceous; surface bright and shining, slightly æneous, very finely and faintly reticulate.

Head wider than thorax at apex; eyes large; antennæ nearly one-half the length of the body.

Prothorax subquadrate, about one-half wider than long; base slightly narrower than apex, both truncate; sides arcuate in anterior three-fourths, faintly sinuate behind; marginal bead fine, narrowly reflexed; disk very moderately convex, somewhat transversely rugose in basal half; median line fine, abbreviated before and behind; anterior transverse impressions feeble, the posterior more marked; basal impressions broad, moderately shallow, bistriate; hind angles subobtuse, carinate, carinæ parallel to the margin.

Elytra scarcely one-half wider than thorax, about one-half longer than wide, oblong-oval; deeply striate; striæ entire, more finely impressed toward tip, fifth grooved at tip, strongly punctate to near apex, then obsoletely so; intervals just perceptibly convex, the third with the first dorsal puncture just posterior to basal fourth, the second about one-third from apex. Anterior tarsi of male with first two joints dilated, first strongly so, quadrate, inner anterior angle feebly prolonged, strongly convex dorsally; second moderately dilated, inner anterior angle moderately produced. Length 3.2 mm.

Diagnostic characters.—Closely related to *timidum,* from which it can be recognized by its coal-black color, deeply striate elytra, and strongly punctate striæ.

Described from three specimens in the Fuchs, Van Dyke and my own collections.

Type collected at Blue Lakes, Alpine county, Cal.; co-types in Eldorado and Placer counties, Cal.

Bembidium concinnum n. sp.

Form moderately robust. Color piceous; surface shining, finely reticulate, with a very faint bluish reflection.

Head wider than thorax at apex; antennæ nearly one-half as long as body. Prothorax subquadrate, rather more than one-third wider than long; base equal to apex, the latter truncate in circular arc; median line fine but distinct, obsoletely abbreviated in front and behind; transverse impressions distinct; sides arcuate in anterior two-thirds, nearly straight or feebly sinuate and converging in posterior third; margin narrowly reflexed; marginal and basal setæ long; basal impressions deep and sharply defined, bistriate; hind angles obtuse, not rounded, carinate; carinæ but slightly divergent from margin.

Elytra oblong-oval; one-half wider than thorax, about one-half longer than wide, and widest near middle; striate, striæ feebly impressed, distinctly punctate to posterior fourth, then obsoletely so to apex, first and second entire, fifth slightly grooved at tip; intervals flat to feebly convex, the third with first dorsal puncture a little more than one-third from base, the second three-eighths from apex. Beneath blackish. Legs rufo-piceous. Length 3.5 mm.

Anterior tarsi of male with first two joints dilated, the first strongly so, slightly oblong; second but feebly dilated, inner anterior angle not noticeably produced; other joints stouter than usual. Female tarsi with joints stouter than usual.

Diagnostic characters.—The scarcely converging frontal grooves, the outer nearly entire, and extension on to the epistoma, with dorsal punctures two, situated on the third interval, place this species in Group XVI of Mr. Hayward's classification. Sufficient has been stated in this paper to render this species easily separable from *sulcatum*, the only other member of the group.

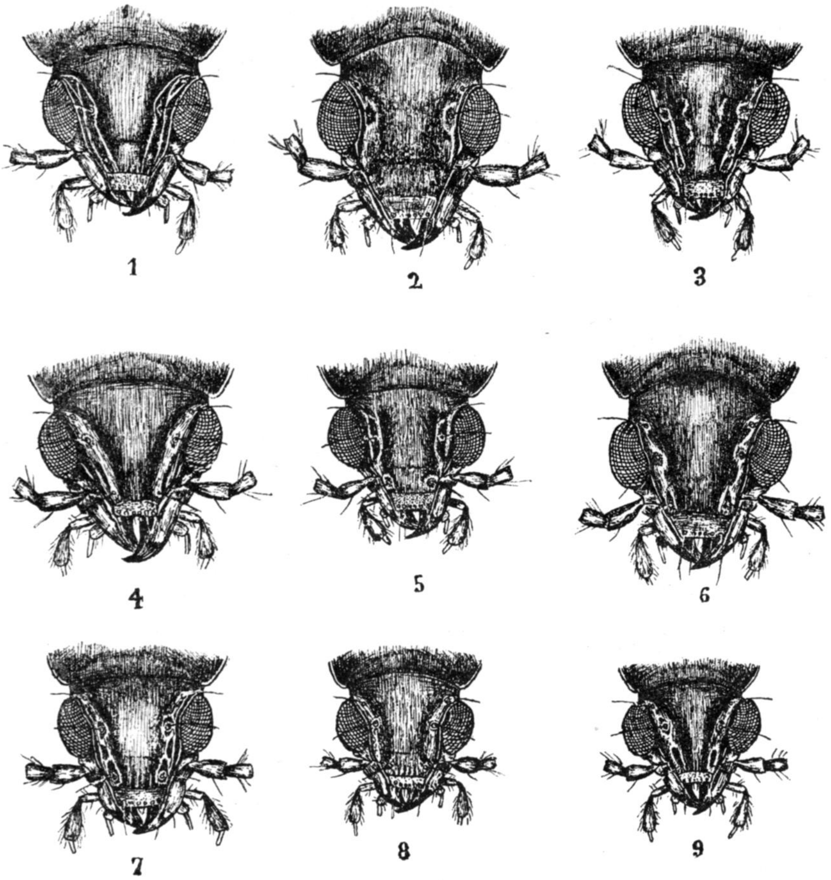
Described from several specimens collected in Eldorado county, Cal., by my friend, Dr. Edwin C. Van Dyke.

All comparative measurements have been made from camera lucida outlines.

In attempting to give the diagnostic characters, I have confined my remarks merely to the species most closely related to those under consideration, as reference to Mr. Hayward's synopsis of group characters will aid in approximately placing any form here described.

EXPLANATION OF PLATE III.

Fig. 1.—*Bembidium sulcatum*, Group XVI (Hayward).
Fig. 2.—*Bembidium bifasciatum*, Group XIII (Hayward).
Fig. 3.—*Bembidium 4-maculatum*, Group XIV (Hayward).
Fig. 4.—*Bembidium anguliferum*, Group XVII (Hayward).
Fig. 5.—*Bembidium affine*, Group XV (Hayward).
Fig. 6.—*Bembidium dubitans*, Group XIV (Hayward).
Fig. 7.—*Bembidium concinnum* n. sp., Group XVI (Hayward).
Fig. 8.—*Bembidium vile*, Group XII (Hayward).
Fig. 9.—*Bembidium assimile*, Group XVII (Hayward).
Magnified 28.5 diameters.



BLAISDELL. FRONS IN BEMBIDIUM.